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The Editor's Page

Wear Testing the Subject of British Textile Institute Conference

"SERVICEABILITY of Textile Fabrics for Clothing" was the subject of the 27th annual conference of The Textile Institute, Manchester Eng., held in Southport, June 9–11. In addition to papers by leading authorities defining "serviceability" and "wearability" of fabrics, and wear testing by abrasion and other methods, there was an exhibition of testing apparatus of a non-commercial character by the various British textile research associations, universities having textile departments, and mill research laboratories. The featuring of this subject by the Textile Institute was influenced in part at least by the present interest displayed in textile quality control and testing for quality by the British retail trade.

Among the papers presented were the following: The Serviceability of Fabrics in Regard to Wear, by Dr. F. T. Pierce, British Cotton Industry Research Association; The Wearability of Fabrics, by C. M. Whittaker; Abrasion Testing of Knitted Fabrics, by Prof. William Davis; Observations on Wear Tests, by J. H. Lester. Abstracts of these papers were published in the June issues of English textile papers, and appear in complete form with accompanying discussion in the July number of *The Journal of the Textile Institute.*

Was Subject of U. S. Institute's First Conference

Wear testing was one of the subjects on the first research list of U. S. Institute for Textile Research, and was the subject of its first open research conference in March, 1933. Following that meeting the Research Committee reported in part as follows:

> "(1) That it seems hopeless at present to try to develop a single abrasion test which can be used satisfactorily on all fabrics. That our

first efforts should be concentrated on the development of a testing method for a single fabric. (2) That the adequacy of any test method must be judged by its ability to duplicate the characteristics of the wear which the fabric received in service. (3) That women's full-fashioned silk hosiery be selected as the fabric to be investigated first."

It was found impossible to finance the hosiery research, but, largely as a result of publicity given the subject of wear testing by the conference, researches on wear testing were undertaken by associations and commercial laboratories. At a meeting of the Research Council, Dec. 1935, "Chairman Emley briefly reviewed the work by associations, laboratories and individual mills . . . noting particularly that of the carpet and hosiery industries, and the development of testing apparatus and methods for specific fabrics. In the discussion that followed there was agreement that progress in wear testing is likely to be most resultful when confined by interested groups to a single class or allied classes of textile products, and that until a large amount of such specialized data is accumulated a basic scientific study of general character and its findings could be of little value. It was, therefore, voted: That the subject of the wear of fabrics and wear testing methods be dropped from U. S. Institute's list."

The conclusions of the Research Council as reviewed by Chairman Emley are so completely confirmed by several of the papers presented at the Textile Institute conference, and particularly by that of Dr. F. T. Pierce, that an abstract of the latter as published in the *Textile Manufacturer* is printed in this issue.

* * *

Science and Empiricism

Sea Island cotton production in the Georgia-Florida belt may be as much as 10,000 bales this season, as compared with less than 100 bales for several years prior to 1935. Increased effectiveness of boll-weevil control is the factor chiefly responsible for the revival of the crop in that section.

* * *

Pearly and **iridescent effects** on textiles are produced by an Austrian invention which, according to *Science News Letter*, "involves making

a lather of solutions of cellulose or cellulose derivatives, and applying this to the material in such a way that the lather solidifies."

* * *

Bathing suits having become so abbreviated as to restrict production seriously when measured in yards or pounds, it is possible that some of the latter slack may be taken up by the production and marketing of a lightweight robe impervious to ultra-violet rays, thus preventing sunburn. Japanese patent No. 111,539 of 1935 has such a finish as its objective. It provides for immersing the cloth in 5% tannic acid, and then in a 2.5% solution of quinine hydrochloride or sulphate.

* * *

Textile interest in the yacht races for the America's cup might have been keener had it been more generally known that Ranger, the cup defender, carried a "quadrilateral jib" made of continuous filament, viscose process rayon yarn—the "Cordura" yarn developed by E. I. du Pont de Nemours & Co., Inc., for heavy duty truck and bus tires. The sail fabric was woven to specifications by Wamsutta Mills.

* * *

New uses of cotton to be encouraged by the cotton diversion program under the provisions of the amended Agricultural Adjustment Act include the following: (1) Covering for irrigation and other ditches; (2) to reinforce fills or cuts for highways, etc.; (3) protection for beehives; (4) protective covering for fruits or vegetables during growing; (5) covering for protecting tree seedlings or shrubs; (6) covering hood or tent in connection with spraying trees, etc.; (7) covering material in construction of permanent or semi-permanent structures; (8) reinforcing material for airport runways, etc.

* * *

The textile drying research, now being conducted by U. S. Institute for Textile Research, should eventually provide information as to safe drying temperatures and conditions for different fabrics which might make the thermostatically controlled electric iron, described in the following news item, of practical value: "Science has discovered that 'heat-rot,' a gradual breaking down of tensile strength in threads as the direct result of too much heat in ironing, is what makes many fabrics go to pieces suddenly and much too soon. To prevent that taking place, a new electric iron, recently displayed, has a heat control which is adjustable to different fabrics instead of temperature. When the temperature desired for a certain field is reached, an indicator notifies the operator, and a thermostatic control maintains that temperature as long as the iron is in use."

The Serviceability of Fabrics in Regard to Wear*

By Dr. F. T. Pierce†

THE textile technologist reacts to the word "wear" by designing a machine to grind a hole in cloth with emery. Then one fabric may show a hole after 100 rubs, another after 120 rubs. And so what?

Early in my experience of testing I met the problem of the wear of varnished healds. Tested by rubbing against emery, the more serviceable wore to fracture more rapidly. Its established superiority in practical performance lay in its hardness, a quality which protected it from abrasion by cotton and size, but did not avail against emery. Softer materials may suffer less abrasions simply because they resist less. Microscopic examination of cloth rubbed against emery or carborundum shows the lesions of the hairs to be tiny, clean cuts. The emery surface itself is seen to be covered with cutting edges as keen as razor blades, and harder. In use also fabrics develop holes: but the similarity between the causes and effects is not sufficiently close to warrant any assumption of similar behaviour in use and test. Many holes in worn garments have been examined at the Shirley Institute and none at all like those produced by the usual kind of "wear test" against emery.

Many other kinds of tests have been devised to imitate the deterioration of fabrics in use. A strip of fabric is subjected to a steadily increasing tension till it breaks, but it must be admitted that this happens more frequently in a testing laboratory than in wear. Ability to withstand tensile stress is undoubtedly a feature in serviceability, but is not a sufficient measure of serviceability. The various destructive agencies co-operate and a truly imitative test must combine them as in use. Even under normal storage conditions, chemical deterioration proceeds continuously. A common test for "ageing" consists in measuring the strength before and after a heat treatment. It is a big assumption to make, that this will foretell the deterioration in years of careful use yet it is imperative to speed up some actions a thousandfold to make tests practicable, and heat ageing is the simplest of these.

Serviceability is not concerned only with the formation of holes in the fabric. Of features distinct from strength, length is perhaps the simplest but the imitative test of shrinkage provides pitfalls enough. Laundry machines are sometimes used for testing, but actually, the shrinkage is not at all sensitive to details of the machinery so long as the material is thoroughly wetted out and given a fair amount of mechanical agitation. Small details of the procedure of drying and pressing are more important. Nor is the percentage shrinkage a direct measure of serviceability. A test to produce maximum laundry shrinkage may produce a slack fabric easily capable of being stretched back 1% to its original dimensions; another fabric might shrink only ½% but resist re-stretching and cause trouble as

* Abstract of paper presented at Conference of The Textile Institute, Southport, Eng., June 9–11, and reprinted from the *Textile Manufacturer*, June, 1937, P. 240–1.

† British Cotton Industry Research Association.

a hat or shoe lining. On the other hand, stretching may cause bagginess and affect serviceability.

One might continue beyond all patience in pulling to pieces the numerous imitative tests constantly being put forward—and scrapped.

A valid imitation of service could be devised only after a thorough survey of the behaviour in use of each fabric—analytical to determine the nature of the causes and effects of deterioration, statistical to determine their relative importance. But when such a survey is made, better use can be made of it than the design of an imitative test. Weak features can be corrected and economies made at the expense of the strong, so that the imitative test would no longer be valid. A holiday tent of flax canvas used, on account of its weight, to need a mule for transport. After a study of performance in the field, it was found that the heavy stresses could be put on a frame of tapes and the walls be made of the finest waterproofed cotton material, so that good service is obtained with a weight suited to a rucksack. Serviceability depends on making-up as well as fabric manufacture, in regard not only to the duration of useful life but also to the features that cause failure. In short, imitation is no substitute for understanding. This does not mean that testing is futile, but that its function is not mere imitation.

Correlation of Fabric Character and Service

The relation between character and behavior is the way of scientific progress. If the environment is simple, constant and known, the behavior of objects therein indicates their character. From the known character, the behavior of an object in any environment may be deduced, in so far as the pertinent facts and relations are known.

According to these principles, the scientific approach to our problem would be (*a*) on the one hand, to determine the character of a fabric not by "wear tests" but tests of staple, structure, strength, resistance to abrasion, etc.; (*b*) on the other hand, to analyse behaviour in service to determine the destructive agencies, the effects they produce and their relative importance; (*c*) then to correlate the measured characters with the effects produced by the several important and essential types of destructive action.

In the present state of the subject it does not seem possible completely to correlate behavior in service with the simplest characters alone—structure and chemical composition. Hence we must accept direct tests of more complex behavior, strength, resistance to abrasion, etc. These should, however, be designed as tests of character, with simple conditions idealising the essential types of destructive action.

Quantitative surveys of the deterioration in use of garments are difficult to carry out, but the prediction of serviceability must contain a large element of guesswork till they are made. It is difficult to gain significant information on the behaviour in use of lines that change in quality. Standardised lines, especially when regularly supplied to large institutions, promise the easiest field for effective statistical treatment. In the meantime, one must rely on general experience and the examination of random samples of goods in service, including complaints arising in commerce.

This unsystematic body of knowledge is sufficient for the correction of isolated features that produce distinctive types of failure. Of two samples one was found to wear out more quickly than another. They proved iden-

tical in structure, save that the former had a larger proportion of short fibre. This provided an obvious explanation in accord with the appearance of the frayed yarns, and an obvious method of improvement. A semi-stiff collar cracked at the fold and an analysis of structure suggested modifications that provided more "give." Undue weakness of white goods is often shown by fluidity to be due to overbleaching. This is a good example of the character test, for the measurement of the fluidity of a solution of cotton in cuprammonium could not be farther removed from an imitative test of disruption, but no test is of more general value.

Some of the points may be brought out by a mere recital of a random selection of investigations into serviceability: wearing into holes, and threadbareness of shirts, sheets, hose, rubbered raincoats, upholstery, overalls, etc., tearing at seam, fraying, creasing, loss of pile or nap, loss of lustre, shininess, loss of shape, shrinkage, sagging, stretching, puckering, curling, weathering, mildew, abrasion, tearing, changes of permeability and water resistance, heat tendering of calender covering, light tendering, etc., etc.

Practical service trials might, of course, often be controlled and intelligently simplified to yield useful results more quickly than a statistical survey of uncontrolled consumer use, *e.g.*, drop tests for parachutes or road tests for motor tyres.

Factors Affecting Fabric Coherency

The most familiar example of an integrated test is the tensile test for strength. Regarded as an imitation of the breakdown of a fabric in use, it is open to severe criticism on many points; but regarded as a test of character, supplementing structure tests, it gives information on the coherency of the fabric that is of undoubted value. That value depends more on the understanding of the effects of tension and on empirical correlation with service than on details of mechanical similarity between use and test.

The character of coherency against tension is not the only feature necessary in a fabric to withstand wear. Rather than devise endless imitations of wear it appears however more fertile to enquire what these other features are and to devise tests for them. The behaviour in use most directly related to coherency when not under tension is resistance to abrasion —not to cutting actions, but to rubbing to and fro that tends to drag the fibres apart by friction and break them only one by one as they become isolated. This is like the untying of a knot by a neat-fingered woman, where tension is like a strong man tugging at it.

Other factors in use that tend to tease the fibres apart and weaken the structure are oscillations of tension and bending, which cause the fibres to move relatively to each other. Abrasion tests are sensitive to the microscopic form and chemical state of the surface, so may usefully be supplemented by other disintegrating tests.

Sharp bending ("cracking test") may disrupt the fibrous or other material itself, in a brittle fabric such as starched, oiled or doped fabric or cloths with yarns of bast fibres.

Quality Measurements

Many a garment is discarded without such indubitable evidence of wear such as disruption; the character has changed so as to render it un-

suited to its purpose. Here enters another function of testing, again to test character, but as a measure of quality rather than behaviour, *e.g.*, changes in length measurements, lustre or colour. The method of expressing the result of a test of gradual deterioration comes into question. The easiest method is to impose a certain amount of treatment—rubbing or what not—and measure the quality of importance before and after. If, however, the quality measure corresponding to the unserviceable condition can be determined, it is more to the point and simpler to determine the amount of treatment necessary to produce this condition. Thus, the number of bends in a cracking test, which make an oilskin permeable to water, may be determined as "useful life"; or the number of rubs necessary to produce unsightly hairiness on a sateen lining.

To determine the end-point of the test, it will, however, be necessary to give a graded series of treatments and obtain the curve of the quality measure against amount of treatment. A general relation may then be indicated, and two or three points will suffice to determine the whole curve. Such a relation has been found between heating and fluidity (or strength) of cotton materials.

Measures of Serviceability

The end-point at which a material must be discarded is not, however, the only measure of serviceability. The quality of the brand new cloth is of interest, the duration of its useful life also, but its quality during the period of service is surely pertinent also to its serviceability. This is one reason for the superiority of the curve mentioned above over the test by one standard amount of treatment or the determination of end-point only.

The conditions of the actual durability test may also take account of conditions of service without degenerating into complex and arbitrary imitations. If a garment, such as a woollen overcoat, is weaker and more severely treated in service while wet, a test in the wet condition is more pertinent and no more complex than in any arbitrary moisture condition.

The effects of these normal structural variations must be allowed for by normal good practice in sampling and analysis. Beyond this, however, the serviceability of a garment is also subject to the "weakest link" principle and by variability. A general averaging of results of a set of tests to give a measure of serviceability tacitly assumes that the fabric will remain serviceable in every way and part, till at some moment it ceases to be —an awkward contingency for apparel from which the imperfections of textile technology will long save us.

A simple example of this point is found in the breakage rates of warps, which show a minimum at a certain percentage of size. Tested by rubbing, the warps show rapidly increasing resistance as the size is increased from low values, with little but still positive effect at higher values, *i.e.*, no optimum value. But the extensibility shows a reverse effect and the optimum in weaving may be ascribed to the change over from abrasion to brittleness as the feature productive of breakage. Probably the most fertile application of testing in regard to serviceability is not in foretelling duration of life but in correcting weak features.

The essentially statistical character of any sound interpretation of destructive tests emphasises the importance of the statistical analysis of the results thereof.

Abstracts

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I. Fibres (Synthetic and Natural) and Fibre Analysis

Exposure: Effect of—in the Field on Grade, Strength and Color of Raw Cotton. Mary Anna Grimes. Texas Agric. Exp. Sta. Bulletin No. 538, Nov. 1936.

Attempts to reduce the costs of cotton production have resulted in the adoption of methods of harvesting which encourage the postponement of picking until most of the bolls are open. As a result the bolls which open early are often exposed to the weather for weeks or even months. This study was undertaken to measure the extent to which the cotton was lowered in grade, staple, strength, and color when thus exposed under normal weather conditions for various periods of time. The cotton used was of the same variety, grown for two seasons at Temple, Chillicothe, and Lubbock regions where soil and climate differ. The grade, strength, and color of unexposed cotton and cotton exposed from 1 to 33 weeks were determined. A drop of one grade had occurred after one week of exposure at one station and after an average of less than 4 weeks for all stations and seasons. A drop of 4 and 5 grades, a decrease in length of from 1/16 to 3/16 inches, and a decrease in price of from 150 to 265 points occurred during exposure. All of the cotton lost strength, but not equally, upon exposure. Cotton grown at Temple lost the lowest and that at Lubbock the highest percentage of the original strength. These differences were not due entirely to differences in rainfall but may have been due in part to greater ultra-violet in the sunlight at the higher altitude. There were regional and seasonal differences in the color. In all cases there was a decrease in either creaminess or brightness, or in both, within 3 to 5 weeks after opening. The grades appear to follow brightness more

closely than they do creaminess. It is concluded that cotton should be harvested, so far as is practicable, not later than 4 or 5 weeks and preferably within 1 or 2 weeks after opening to assure a product of high quality in grade, strength, and color. (C)

FLAX AND HEMP COTTONIZATION IN POLAND. *Linen Trade Circ.*, 1937, V. 23, No. 1209, P. 4; abs. in *J. T. I.*, April 1937, P. A181.

Experiments made in Poland on the cottonization of flax and hemp have proved the hemp more suitable for the process; treated in this way it has been mixed with cotton, giving excellent yarns, particularly of the coarser types, equal in durability and smoothness to 100% American cotton yarns. Materials with 20% cottonized hemp have given satisfactory results in bleaching and dyeing. (C)

FLAX AND TOW: CLASSIFICATION OF. J. Barbour Pears. *Tex. Mfr.*, May 1937, P. 179, 188.

A detailed examination of the different classes and grades of flax and tow and the types of yarns for which each is most suited, and the economics of flax buying. (C)

FLAX-LIKE COTTON FIBERS: DISTINCTION FROM FLAX ULTIMATE FIBERS. E. Slattery. *J. M/cr. Coll. Tech. Text. Soc.*, 1936, V. 26, P. 16–7; abs. in *J. T. I.*, April 1937, P. A213.

Cotton fibres are sometimes encountered with transverse markings; they might be mistaken for the ultimate fibres of flax. In counts on samples of about 300 fibres the author has found as much as 26–27% of Bengals and Oomras cottons with these markings and from about 2–7% of the finer cottons. The fibres are readily distinguished from flax ultimate fibers by Miss Clegg's Congo red staining test. The cotton fibres show typical spiral markings but flax fibres a patchy red staining. When the stained fibres are kept in glycerol the spiral bands of cotton gradually merge into a general staining. Sometimes parts of the cotton and flax fibres peel away; an illustration of a flax fibre shows three distinct layers. (C)

FULLING AND FELTING POWER OF WOOL: METHODS OF INCREASING THE. R. Brauckmeyer and H. Rouette. *Deut. Wollen-Gewerbe*, 1937, V. 69, No. 2, *Erfahr u. Forsch.*, P. 101–2; *Mell. Textilber.*, 1937, No. 4, P. 293; abs. in *C. A.*, 1937, V. 31, Col. 1624.

The felting power of coarse wool can be improved by the addn. of chemicals to raise the swelling power of these wools appreciably. This treatment involves the use of H_2O_2 which increases the swelling action so that the increased felting power of the wool can be utilized industrially. The results of comprehensive tests show that while during the bleaching with H_2O_2 in a normal neutral or faintly alk. bath the felting power is not increased (it may be decreased by inappropriate treatment) the use of acidified H_2O_2 baths at a pH of 1–2 produce a greatly improved felting power in all wools and animal hairs. While in the ordinary H_2O_2 bleaches the O is primarily used to destroy or alter the natural yellow color-producing dye in the wool, this acid H_2O_2 application causes a chem. alteration of the keratin resulting in the loosening of the inner fibril layer from the outer cover of the epidermal cells. While aside from a slight change in tint the thus

treated wool gives no external indication of such a change this change is evident in aq. soln. by the increased swelling power of the fibres resulting in the industrially important improvement of the felting power. Experimentally it was found that in this treatment the cystine of the wool is partly oxidized to taurine and H_2SO_4. Practical applications of this treatment are pointed out. (W)

GERMAN RESEARCH INSTITUTE FOR TEXTILE INDUSTRY IN DRESDEN: NINTH COLLOQUIUM OF THE. (German.) Reported by Heinrich Christoph. *Kunstseide,* May 1937, P. 191–93.

The discussion reported concerns the state of cellulose in solution and reviews work which has been done by a number of authorities over the last few years. The conclusions may be summarized as follows: The breaking down of cellulose by solvents leads directly to isolated long-chain molecules. The break-down is dependent upon the nature of the solvent, the length of the long-chain molecules, the temperature and the concentration. Such molecular solutions can exist in organic bases and inorganic acids. The solutions of cellulose as viscose are predominantly micellar, or in ammoniacal copper oxides they are definitely micellar. Also celluloses which have been broken down to isolated long-chain molecules can be again recrystallized to micelles since the original micelle is quite similar. The article includes the chemical changes produced by the reactions of certain solvents and the equations for these actions are noted. (S)

KAPOK: FRESHNESS TEST. W. Spoon and M. Dulfer. *Ber. Afdeel. Handelsmuseum, Kon. Vereen. Kolonial Instituut,* 1936, No. 108, 15 pp.; abs. in *J. T. I.,* April 1937, P. A214.

Second-hand kapok may be distinguished from fresh material by means of the springing test devised by Hansma, but not by determination of pentosan content. (C)

NITROGEN COMPOUNDS OF COTTON AND LINEN. M. M. Chilikin. *Bull. federation intern. assoc. chim. textile couleur,* 1935, No. 5, P. 367–85; abs. in *C. A.,* V. 24, P. 3375; 1937, V. 31, Col. 869.

The NaOH ext. of cotton is a dark amino acid very similar to $(MeO)_2$-$C_6H_3CH_2CHNH_2CO_2H$. Linen yields a similar product. Hypochlorite converts these acids into chloramines. (W)

PROTEIN RAYON: PRODUCTION. H. J. Henk. *Kunstseide,* 1937, V. 19, P. 6–8; abs. in *J. T. I.,* April 1937, P. A182.

Methods for the production of artificial fibers by spinning protein solutions are reviewed and solvents for use in the preparation of the spinning solutions are discussed. It is pointed out that the products obtained do not show satisfactory properties. Owing to the uncertainty of supply of suitable raw materials and the lack of knowledge concerning the constitution and properties of proteins the outlook for protein fibres does not at present appear promising. (C)

STRUCTURE OF THE COTTON FIBRE. Wanda K. Farr. *J. Appl. Physics,* April 1937, P. 228–32.

Coverage in large part the same as in "A New Viewpoint in the Study of Cellulosic Textile Fibres," *Tex. Rsch.,* Dec. 1936, P. 65–69. (C)

SULFUR IN OXIDIZED WOOLS: STATE OF THE. Milton Harris and Arthur L. Smith, Research Associates at the National Bureau of Standards of the A. A. T. C. C. Research Paper RP998. *B. S. J. Rsch.*, May 1937, P. 623–8.

During treatment with oxidizing agents, the disulfide sulfur in wool appears to be changed to higher states of oxidation. The existence of oxidation derivatives of the disulfide compounds is indicated by the alkali-solubility determination, the lead acetate test, by reduction with hydrochloric acid-potassium iodide solutions, and by cystine analyses. The intermediate oxidation derivatives of cystine are unstable under the conditions necessary for protein hydrolysis, and at least one of them, cystine disulfoxide, is partially converted to cystine. The results indicate that the values obtained for the cystine content of oxidized wool may be expected to be higher than the actual cystine content since they represent the amount of cystine formed from the partially oxidized cystine compounds as well as from unoxidized cystine groups. (C)

TEXTILE FIBRES: STRENGTH. O. Schmidhäuser. *Textilber.*, 1936, V. 17, P. 905–10; abs. in *J. T. I.*, April 1937, P. A215.

Tables showing the fineness, strength and extensibility of the various types of cotton (28 varieties), wool (11), bast (15) and other fibres and rayon staple fibres (28) are given and discussed. Staple fibres are compared with other fibres and their use in mixtures is briefly discussed. (C)

TRANSVERSE STRUCTURAL ELEMENTS IN NATURAL VEGETABLE TEXTILE FIBRES: EXISTENCE OF. A. Zakoshchikov. *Helv. Chim. Acta*, 1936, V. 19, P. 973–8; abs. in *C. A.*, 1936, V. 30, Col. 281; 1937, V. 31, Col. 868.

A reply to R. Haller (*C. A.*, V. 29, Col. 6065). Differences in opinions as to existence of transverse structural elements appear to result from differences in technic. Photomicrographs are given in support of the author's view that such transverse elements exist. (W)

II. YARNS AND FABRICS

FABRIC WIDTH VARIATIONS: WHAT CAUSES. H. R. Mauersberger. *Rayon Tex. Mo.*, April 1937, P. 88–9.

The causes are determined and remedies recommended. (C)

"FIBERGLAS" PRODUCTS. J. L. Tucker. *Am. Dye. Rptr.*, April 5, 1937, P. 182–5.

The paper summarizes the physical properties of "Fiberglas" and describes products for which they are claimed to be adapted. (C)

GEOMETRY OF CLOTH STRUCTURE. Fredk. T. Peirce. *J. T. I.*, Mar. 1937, P. T45–T96.

If measurements of cloth structure are presented as a number of absolute length measurements, such as for example, thread spacings and diameters, the geometrical form of the structure and the extent of its similarity to other structures, is not immediately evident. If, however, one such measurement be chosen as a basic length merely to show the scale of the structure, and if all the other measurements are then expressed as ratios

relative to it or to each other, then similarities or differences of geometrical form stand out clearly and geometrical analysis has a general validity, which is independent of the scale. Physical studies may then proceed from geometry by the use of physical constants of the material and laws describing the effect of scale or absolute dimensions. To link up the usual weight units of textiles with geometrical analysis, quantities based on the inverse square root of the yarn counts are suggested. The main applications are of two kinds—the determination of the lengths and diameters of the threads in known (tested) fabrics or, conversely, the prediction of structural changes when the lengths and diameters are known. The latter is usually a problem in crimp interchange, consequent on some known change in dimensions or other condition. According to the known condition, the problem takes various forms and the various methods of attack are discussed. A preliminary reference is made to statics, the balancing of forces in the threads, either of tension or bending, but an effective discussion of statics must await further development of the mathematical analysis.

Dimensional changes observed in experiments on fabrics are analyzed into three components due to yarn length change, swelling of thread section or flattening thereof, and crimp redistribution. A canvas was stretched by various amounts warp and weft-way and the relations between length and breadth observed were compared with theory, also the changes in thickness. The shrinkage of a poplinette is analyzed into its three components, shown graphically as in imaginary sequence of the actually concurrent changes. This analysis is given in a short form for another cloth, and the cause of shrinkage is traced to the difference between the crimp balances due to calendering and to elastic forces respectively. A similar discussion illustrates the geometrical analysis of a 2/2 twill and demonstrates that this cloth must have become jammed in both directions in the shrinkage test. The balance of crimps in a set of shrink cloths is analyzed and shown to be reasonably accordant with the theory of elastic threads. From data on a set of loom-state poplinettes of varied picks per inch, it appears that the crimps are determined mainly by the available length of weft in a pick. The last example is an analysis of the stretching of a flax canvas, in which the data show discrepancies due to error and variation, also of a tensile test thereon, from which it appears that a good prediction of the tensile behavior follows from the theory, assuming the yarn to extend to the same amount as in a single-thread test. (C)

GLOSS AND GLOSSINESS. Deane B. Judd. *Am. Dye. Rptr.*, April 19, 1937, P. 234–5.

A tentative outline of concepts, definitions, and terminology, the result of a conference of the author with P. H. Walker, E. F. Hickson, K. S. Gibson and R. S. Hunter. (C)

INSULATION: DEVELOPMENTS IN TEXTILE. A. A. New. *Tex. Mfr.*, May 1937, P. 199–202.

The following subjects are discussed: factors governing insulation properties of textiles; effects of esterification of cotton and fireproofing of cellulosic yarns, and chemical treatments or modifications of wool and silk; relation of insulation resistance to moisture capacity. (C)

MEASURING COLOR IN MANUFACTURED GOODS. R. Donaldson. *Tex. Mfr.*, April 1937, P. 158, 166.

Objective and subjective aspects of color and the scope of color measurements on the trichromatic system, using instruments. (C)

MOISTURE-CONTROL DEVISE APPLIED TO COTTON SLASHING. Richard P. Hawkins. *Tex. Wld.*, Mar. 1937, P. 127.

Describes the Moist-O-Graph, a new type of recording and controlling instrument for installation on cotton slashers, developed by Brown Instrument Co., Philadelphia, Pa. (C)

MOISTURE IN TEXTILES. Albert C. Walker. *J. Appl. Physics*, April 1937, P. 261–8.

More detailed coverage of the same subject by the same author in *Tex. Rsch.*, 1936, April, P. 229–39; May, P. 289–97. (C)

MOLESKINS: PROCESSING. *Tiba*, 1936, V. 14, P. 829–33; abs. in *J. T. I.*, April 1937, P. A201.

The tanning, dyeing and bleaching treatments are described. (C)

NON-SLIP FINISH ON RAYON FABRICS. H. C. Borghetty. *Am. Dye. Rptr.*, May 17, 1937, P. 268–9. (C)

PLIABILITY OF FIBRES. A. Rogokina and S. Lasarewa. *Mell. Textilber.*, 1937, P. 17; abs. in *Rayon Tex. Mo.*, April 1937, P. 113.

Pliability is one of the important spinning qualities of fibres and it is of great interest to examine the conception and find a mathematical expression for it. The present article is an attempt to solve the problem. Equations have been worked out which can be used to judge the pliability of fibrous raw materials. (C)

RAYON CRÊPE VARIATIONS. W. F. Macia. *Canadian Tex. J.*, May 28, 1937, P. 34; *Daily News Record*, May 17, 1937; *Am. Dye. Rptr.*, June 14, 1937, P. 329–35.

Abstract of an address at the National Rayon Conference in May. The author as a research fellow of the A. A. T. C. C. and the Throwsters Research Institute has been engaged on a study of rayon crêping, and his paper is based in large part upon results of this study. (C)

RAYON GOODS: WHY DO—SHRINK AFTER FINISHING? Ernest H. Doute. *Rayon Tex. Mo.*, May 1937, P. 75–6. (C)

RAYON SIZING AND CRÊPING. X. Drying. G. E. Wilson. *Silk and Rayon*, 1936, V. 10, P. 962, 964, 970; abs. in *C. A.*, 1936, V. 30, Col. 8627; 1937, V. 31, Col. 1625.

The important conditions to be observed in drying sized yarns are gradual raising of temp. to a max. of 60° C. and thorough circulation of air to prevent local over-heating. App. for open air, static and continuous drying are described. (W)

RAYON WARP KNITTED FABRICS: PRODUCTION OF CRÊPE EFFECTS IN. A. Elster. *Kunstseide,* 1937, V. 19, P. 22–30; abs. in *J. T. I.,* April 1937, P. A194.

Crêpe effects can be produced in rayon warp-knitted fabrics by the juxtaposition of small areas of dense fabric formed from two superposed layers of loops and areas of looser structure composed of only one layer of loops. Numerous examples of patterns that can be obtained in this way are shown and the methods of production are explained. (C)

ROVING GOES LONG DRAFT. *Tex. Wld.,* Mar. 1937, P. 107.

Change to single process promises to hold spotlight as outstanding trend of 1937 in cotton manufacture. (C)

RUBBERIZED FABRICS. Färber. *Monatschr. Textil-Ind.,* 1936, V. 51, P. 297–9; abs. in *C. A.,* 1937, V. 31, Col. 870.

The historical development of the impregnation of fabrics with rubber is briefly stated, various rubberizing formulas are given and the prepn. of the mixts. is described. (W)

SETTING CLOTHS: METHODS OF. *Wool Rec.,* 1937, V. 51, P. 337, 339; abs. in *J. T. I.,* April 1937, P. A201.

Variations obtainable in methods of crabbing on the two-bowl machine are described. (C)

SIZED RAYON YARN: INVESTIGATION. Gerstner and J. Walther. *Mell. Textilber.,* 1937, No. 4, P. 289.

An attempt was made to determine the weaving qualities of the sized yarn by various testing processes applied to individual yarns. It was found that it is possible thereby to draw conclusions as to the thread breakage to be expected in the loom, but not as to the usefulness of the sizing for weaving purposes. Thus fluffiness, which is to be regarded as the chief cause of the difficulties met with in weaving rayon, could not be reliably determined in a single test of an individual yarn. The only possibility of recognizing the properties of the warp and the size applied in respect of the appearance of fluffiness was to test the yarn in the loom after it had been sized in a definitely ascertained way. (C)

SIZING OF RAYON CRÊPE YARNS AND THE EFFECT OF ALKYL RADICLES ON THE SOFTENING POTENCY OF OILS. H. H. Mosher. *Am. Dye. Rptr.,* April 5, 1937, P. 186–91. (C)

SIZING, WEAVING, AND ABRASION ON THE PHYSICAL PROPERTIES OF COTTON YARN: EFFECT OF. Walter T. Schreiber, Martin N. V. Geib and Omar C. Moore. *B. S. J. Rsch.,* May 1937, P. 559–563; Research Paper RP993.

A method was developed for determining the effects of the amount and quality of sizing on the physical properties of cotton warp yarns and on their performance during weaving and abrasion tests. The strength, elongation under a 35-gram load and at rupture, and the permanent set under a load of 35 gram were measured on yarns before and after sizing them with

white-potato starch; after weaving and removal from the cloth; and before and after abrasion in a laboratory apparatus simulating the effects of a loom. A simple mill method for the testing and control of sized yarns, based on the results, is suggested. This study was carried out in the laboratories of and in co-operation with the Alabama Polytechnic Institute, Auburn, Ala. (C)

SOFTNESS OF HANDLE IN TEXTILE MATERIALS. "TECHNOLOGIST." *Tex. Merc.*, 1936, V. 95, P. 485, 489; abs. in *J. T. I.*, April 1937, P. A201.

The question of handle in connection with textile materials of animal and vegetable origin is discussed. The effect of various finishes is described and emphasis is laid upon the importance of swelling, solidity of the constituent fibres, rigidity and roughness of the fibre surface. In addition, some of the fundamental principles underlying certain finishing processes, *e.g.*, Rigmel and Sanforizing, are mentioned. (C)

SPINDLE: VANISHING. A. W. Benoit. *Cotton*, May 1937, P. 79–80; *Am. W. & C. Rptr.*, April 29, 1937, P. 201, 203, 211.

This is an interesting analysis, by an engineer, of major trends in the cotton-textile industry; a clear picture of what has been happening, and why. It leads to a conclusion that there is yet much liquidation needed to "balance" the industry. (C)

SPUN RAYON AND WOOL. H. O. Koecke. *Klepzig's Textil-Z.*, 1937, V. 40, P. 2–3; abs. in *C. A.*, 1937, V. 31, Col. 1624.

A review of the use of spun rayon in place of or in conjunction with wool in the manuf. of various textile products. In an attempt to enlarge such uses exptl. work is carried out on spun rayon to (1) create a stable curling effect, (2) raise the elasticity by the addn. of suitable chemicals to the spinning soln., (3) lower its swelling power, (4) produce a surface structure similar to that of wool and (5) produce hollow fibres. (W)

SPUN RAYON CHAINS (FOR THE WEAVING OPERATION): PRELIMINARY TREATMENT OF. Alfred Schejnoha. *Klepzig's Textil-Z.*, 1937, V. 40, P. 61–2; abs. in *C. A.*, 1937, V. 31, Col. 2015.

A discussion of tech. and chem. treatments including proper sizing. (W)

SPUN RAYON IN THE VARIOUS PHASES OF THE TEXTILE INDUSTRY. B. A. Müller. *Monatschr. Textil-Ind.*, 1936, V. 51, Fachheft III, P. 57–8; abs. in *C. A.*, 1937, V. 31, Col. 1215.

A brief review of the properties and uses of viscose, Cu and acetate spun rayons. (W)

SPUN RAYON: MANUFACTURE AND PROPERTIES OF. F. Bonnet. *Am. Dye. Rptr.*, May 3, 1937, P. 248–53.

Paper presented at Feb. 26, 1936, meeting of A. A. T. C. C., New York Section. (C)

TESTING OF TEXTILE MATERIALS. *Tex. Mfr.*, May 1937, P. 173–6, 204.

The following papers on the study of textile materials and the testing of textile materials were included in the symposium of the International Association for Testing Materials, London, April 19–24, 1937:

Chemical Tests for Textiles, Dr. H. Phillips; Mechanical Tests for Textiles, Dr. B. H. Wilsdon; Properties of Bituminous-Fibrous Materials, Dr. J. Ph. Pfeiffer and H. Eilers; Determination of the Cotton Content of Asbestos Yarns with a Calorimetric Bomb, Dr. R. De Benedetti; Testing Resistance of Fabrics to Wear, Dr. F. Maillard; Herzog-Geiger Fabric Wearing-test, Dr. R. Severi; Methods for Testing the Color-fastness of Dyed Textiles, W. D. Appel; Measurement of Light Fastness to Dyeing, R. Toussaint; Structure and "Finer" Properties of Artificial Fibres, Prof. H. Mark; Testing Rayon for Damage During Finishing, Prof. Weltzien. (C)

TIRE CORD THREADS: MANUFACTURE OF. J. A. Colin. *Tex. Mfr.*, March 1937, P. 105–6.

Difficulties in tire cord manufacture arise from the sensitivity of the folded or cabled threads to variation of tension or twist. A system of positive control of lengths of component and of twist is mentioned. (C)

WALLPAPER AND ATOMS. N. G. Buerger and J. S. Lukesh. *Tech. Rev.*, June 1937, P. 283, 342, 370.

Describes how a study of nature's crystal patterns and the pattern theory developed by crystalographers may aid designers of wallpaper, textiles, linoleums, etc. (C)

(WOOL) MILL HUMIDIFICATION: QUESTION OF. M. C. Marsh. *Tex. Mfr.*, March 1937, P. 111–2.

The scope of humidification in the wool industries and factors affecting the choice of plant and its control in any particular case. (C)

WOOL-STAPLE FIBRE MIXTURE FABRICS: PROPERTIES. *Silk & Rayon*, 1937, V. 11, P. 36, 38; abs. in *J. T. I.*, April 1937, P. A219.

Additions of viscose staple fibre to wool make the production of a good white possible with less drastic bleaching, and bleached mixture fabrics do not turn yellow in use as quickly as all wool fabrics. The staple fibre also improves the lustre and reduces the shrinkage but if high proportions of viscose staple fibre are used there is a danger of stretching on washing. It is not possible to obtain in a mixture fabric the same handle as in an all-wool fabric. Quite a low proportion of viscose staple fibre in a wool fabric can diminish its usual warm handle. (C)

WOOL STRUCTURE CHANGES IN INITIAL PREPARING. *Wool Rec.*, 1937, V. 51, P. 93, 95; abs. in *J. T. I.*, April 1937, P. A201.

An article discussing faults liable to arise in the crabbing process, and the part played by changes in the wool structure. (C)

III. Chemical and Other Processing (Not Otherwise Classified)

Absorption of Phenols and Phenol Carboxylic Acids by Cellulose. K. Brass and O. Gronych. *Kolloid Z.*, 1937, V. 78, P. 51–78; abs. in *J. Soc. Dyers Col.*, April 1937, P. 149. (C)

Alkyl Groups on the Properties of Anthraquinone and Fluorescein Dyes: Effect of. R. M. Harris, G. J. Marriott and J. C. Smith. *J. Chem. Soc.*, 1936, P. 1838–44; abs. in *C. A.*, 1937, V. 31, Col. 1620. (W)

Bleaching Processes: Behavior of Mixture Fabrics of Cotton and Staple Fibre in Different. H. Baier and W. Hundt. *Mell. Textilber.*, 1937, No. 4, P. 301.

Because of excessive losses of staple fibre in bleaching processes accompanied by an alkali boil, it is recommended that "recently developed hydrogen peroxide bleaching processes without the kier boil" be used. (C)

Cellulose: Evaluation of Chemical Tendering of—by Cellulose Viscosity Measurement. F. H. Guernsey and L. T. Howells. *Am. Dye. Rptr.*, Feb. 8, 1937, P. 62–7.

Paper presented at A. A. T. C. C. Annual Meeting, Providence, R. I., Dec. 5, 1936. (C)

Cotton-viscose Staple Fibre Fabrics: Mercerization. *Tex. Merc.*, 1937, V. 96, P. 37–8; abs. in *J. T. I.*, April 1937, P. A198.

The action of caustic soda on viscose staple fibre is discussed and treatment at 30–40° C is recommended for the mercerization of cotton-viscose staple fibre mixtures. The injurious action of caustic soda of 20° Tw. on viscose staple fibre and the danger of damage during the washing process are pointed out. Washing should be effected with a copious supply of hot to boiling water. An alternative method of washing depends on the use of water containing not less than 10% of common salt. Caustic potash is without harmful action on viscose staple fibre at all concentrations up to 80° Tw. and can be used with advantage for the mercerization of mixture fabrics. (C)

Delustering of Rayon with Tin Compounds. *Tex. Mfr.*, March 1937, P. 116.

Delustering of rayon hose has not been satisfactory, difficulty being experienced in either evenness or permanence. Comments are made on some new methods. (C)

Desorption of Substantive Dyestuffs. A. M. Patel. *Am. Dye. Rptr.*, Feb. 8, 1937, P. 55–8.

From the data presented in this paper, it will be clear that attempts to increase the fastness of the material dyed with substantive dyestuffs to washing, should be directed towards converting the dye molecule absorbed by the fibre into a substance which has very negligible solubility either in water or in dilute soap solutions. Looking to the fact that the substantive colors are the sodium salts of the sulfonic acids of substances with high

molecular weights, it seems quite possible that by substituting the sodium radical by a complex cation, the fastness can be increased. This has been achieved partly. (C)

DETERGENT ACTION AND ITS RELATION TO WETTING AND EMULSIFICATION. N. K. Adam. *J. Soc. Dyers Col.*, April 1937, P. 121–9.

The nature of detergent action, wetting, dispersion, and emulsification is discussed with particular reference to the surface tensions of the solutions, their interfacial tensions against oil, and the adhesion of the detergent solutions and the oils for the solid surface being cleaned. It is suggested that the essential part of detergent action is a displacement of the oil from the solid surface by the aqueous detergent solution, and a formula is deduced showing the relative importance of the different surface tensions and adhesions in producing this displacement. It is shown theoretically, and experimental evidence is adduced to confirm, that neither the lowering of surface tension, nor the lowering of interfacial tension alone, is the predominating factor in detergent efficiency; but the contact angle formed by the interface between the oil and water, with the solid surface, is closely related to detergent efficiency. It is also shown that quite large amounts of some detergents, especially soap, can be removed from solution by adsorption on woolen serge. The effectiveness of different detergents of the paraffin chain salt, or "soap-like" type, varies considerably according to the nature of the textile fibre being washed; on cotton, the differences between detergents are much less marked than on wool. (C)

DIRECT DYES AND THEORY OF SUBSTANTIVITY. P. Ruggli. *Bull. Soc. chim.*, 1936, V. 5, No. 3, P. 2165–71; cf. *J. Soc. Dyrs Col.*, Mar. 1937, P. 107. (C)

DISPERSED SYSTEMS IN THE TEXTILE INDUSTRY. H. Walland. *Monat. Textil-Ind.*, 1937, V. 52, P. 21–3; abs. in *C. A.*, 1937, V. 31, Col. 2015.

The characteristics of three types are reviewed. (W)

DYE TESTING FOR TEXTILE APPLICATION: SOME ASPECTS OF. John Brown. *J. Soc. Dyers Col.*, Mar. 1937, P. 87–91. (C)

DYEING OF ACETATE RAYONS. F. Bonnet. *Am. Dye. Rptr.*, May 17, 1937, P. 265–8.

Describes methods which may be used for determining relative dyeing properties. These methods of testing were worked out in England, and all of the dyes mentioned are those commonly used in Great Britain. (C)

DYEING OF CELLULOSIC TEXTILE FIBRES: NEW RESEARCH VIEWPOINT IN THE. Wanda K. Farr. *Am. Dye. Rptr.*, Mar. 22, 1937, P. 143–5.

From the viewpoint of the separable membrane constituents and their original relationship in the untreated fibre, we have a new experimental approach to many of the problems involved in the reactions of fibres to dyes. We must learn whether or not the particular dye in question reacts with the surface of the fibre, with the cementing material over the surface of the particles, with the pr[illegible]le itself, or with the entire mass of membrane materials. In all of [illegible] determinations, such general problems as the extent of the reactio[illegible]mum conditions for its completion,

its fastness, etc., must be investigated simultaneously. For the time being many of the theoretical bases for experimental procedures may be abandoned while observations of the specific reactions of the visible membrane constituents are under way. Where these observations may lead is unknown. We have merely a new viewpoint for more tangible research, not an immediate application. (C)

DYEING OF COTTON AND WOOL: CRITICAL COMPARISON OF THE. Karl Volz. *Monat. Textil-Ind.*, 1936, V. 51, P. 299–302, 330–2; abs. in *C. A.*, 1937, V. 31, Col. 1621. (W)

DYEING OF COTTON-SPUN RAYON MIXED FABRICS. Karl Ottenschläger. *Deut. Färber-Ztg.*, 1936, V. 72, P. 557; abs. in *C. A.*, 1937, V. 31, Col. 867.

A brief description. In alk. solns. spun rayon swells to varying extents. This renders the fabric more compact and makes the penetration of the dye more difficult. In the case of mixts. with high spun-rayon contents the author recommends the addition of 1 g. Humectol CX or Nekal BX extra per l. of dye vat to bring about a good wetting effect. If the spun rayon contents are low pre-cleaning with Laventin HW is recommended. (W)

DYEING UNSPUN COTTON WITH ANILINE BLACK. M. Aymondin. *Tiba*, 1936, V. 14, P. 689, 691, 763, 765; abs. in *C. A.*, 1937, V. 31, Col. 867. (W)

DYEING WOOL IN A TURBULENT BATH. G. Zotov. *Sherstyanoe Delo*, 1936, No. 6, P. 38–43; abs. in *C. A.*, 1937, V. 31, Col. 2011.

Dyeing wool with agitation of the bath by means of air bubbles (cf. Rendell and Thomas, *C. A.*, *29*, 5661) was studied under different conditions. Turbulence caused a marked improvement in the dyeing of felt, a slight improvement in the dyeing of woolen yarn and no effect in the dyeing of fur. It is concluded that the influence of turbulence is the less the greater the specific surface of the dyed sample. The method may find an application only for dyeing dense fabrics. (W)

FASTNESS PROBLEMS IN THE DYEING OF SPUN RAYON. Fritz Günther. *Monatschr. Textil-Ind.*, 1936, V. 51, Fachheft III, P. 76–7; abs. in *C. A.*, 1937, V. 31, Col. 1214.

Various dyeing problems are discussed and the effects of a no. of types of dyes on spun rayon are described. Although satisfactory fast dyeings can be obtained with spun rayon alone no satisfactory method has yet been developed for the dyeing of mixed yarns and fabrics. The prepn. of the better dyeings requires a good deal of work and is, therefore, quite expensive. (W)

FASTNESS TESTS (OF TEXTILE GOODS) IN DIFFERENT COUNTRIES: COMPARATIVE STUDIES OF. E. Schupp. *Monatsh. Seide Kunstseide*, 1936, V. 41, P. 441–5, 488–9; abs. in *C. A.*, 1937, V. 31, Col. 1213.

A survey covering the standardization of tests for the fastness to light, examns. for fastness against sweat and the testing of the fastness against washing. Cotton, wool, unweighted silk, weighted silk, viscose rayon and acetate rayon are included. (W)

FASTNESS TO LIGHT OF DYED TEXTILES: DETERMINATION OF. H. Ris. *Klepzig's Textil-Z.*, 1936, V. 39, P. 731–2; abs. in *C. A.*, 1937, V. 31, Col. 1622.

A lecture reviewing the historical development of the evaluation of fastness to light of dyed textiles in various countries. (W)

FORMALDEHYDE: KEY CHEMICAL FOR ANTI-CREASE FINISHES. P. H. Anderson. *Tex. Col.*, March 1937, P. 311–2. (C)

HEAT RESISTANCE OF SILK FIBRE TREATED WITH VARIOUS CHEMICAL REAGENTS. R. Inoue and A. Matsuura. *Bull. Sericult. Silk-Ind.*, (Japan), 1936, V. 9, P. 85–8 (in English 88–9).

Silk was treated with Na silicate and neutral Na and K phosphate at 20° C. using concns. from 1 to 25%. The 5% soln. gave greatest heat resistance in all cases. The solns. of higher concn. weakened silk and decreased its resistance to heat and its elasticity. Solns. of 10% or less did not show these effects. (W)

HEATING OF DYEING VATS WITH HOT WATER. M. Loescher. *Deut. Wollen-Gewerbe*, 1936, V. 68, P. 1455–6; abs. in *C. A.*, 1937, V. 31, Col. 2011.

Methods of heating with hot water are given and the advantages of this procedure are pointed out. (W)

HOSIERY BOIL-OFF: CONTROL OF pH AND TIME VITAL IN. Wm. T. Leggis. *Tex. Wld.*, April 1937, P. 142. (C)

HYDROPHILIC PROPERTIES OF CELLULOSE. III. K. Kanamaru and T. Nakamura. *Kolloid Z.*, 1937, V. 78, P. 83–7; abs. in *J. Soc. Dyers Col.*, April 1937, P. 160.

The effects produced on the hydration capacity of cellulose by decreasing its electro-negative charge and increasing its electro-positive charge, by adsorption of aluminium hydroxide, have been determined. Thus, an increase in the proportion of aluminium hydroxide absorbed, or a decrease in the electro-negative properties of the fibre, is accompanied, in general, by a decrease in hygroscopicity, while increase in the charge until the fibre carries a positive charge increases the hydrophilic properties. (C)

MACHINE DYEING OF SPUN RAYON. E. Köster. *Klepzig's Textil-Z.*, 1936, V. 39, P. 633–4; abs. in *C. A.*, 1937, V. 31, Col. 1215.

The phys. and chem. procedures are briefly described, textile aids are listed and numerous dyes are given which are suitable for the dyeing of spun rayon. (W)

MANGANESE IN TEXTILES: DETERMINATION AND OCCURRENCE OF. (German) Kehren. *Mell. Textilber.*, 1936, No. 9, P. 727.

The manganese content of various yarns and fabrics is tabulated in detail. Research upon the determination of manganese in rayon has not yet been brought to a conclusion and the results will be dealt with in another article at a later date. If it is claimed that the manganese content of rubberized goods is too high, the first procedure suggested is to examine the mill water, and a process for the purpose is given. Generally speaking, it is more difficult to remove manganese from water than iron because the oxidation of manganese is subject to other conditions. (S)

MATT RAYON. C. L. Moore. *Rayon Tex. Mo.*, 1937, March, P. 79–80; May, P. 76–7.

Delustering as an after-treatment with special reference to surface active cations. (C)

MICELLAR STRUCTURE OF RAYON IN RELATION TO DYEING. H. H. Mosher. *Rayon Tex. Mo.*, 1937, May, P. 53–4, June, P. 61–4.

The author describes newly developed theories in scouring and dyeing. (C)

MINERAL OILS: APPLICATION IN THE TEXTILE INDUSTRY. *Spinn. u. Web.*, 1936, V. 54, No. 51, P. 8–9; abs. in *J. T. I.*, April 1937, P. A197.

A general account is given of the use in the textile industry of mineral oils and products prepared from them. Reference is made to mineral oil soaps, softening emulsions (especially those containing triethanolamine), mixtures for laying dust, etc., and several patents are cited. Traces of diphenylamine are claimed to prevent oxidation and substances, including quinoline yellow, are mentioned that quench the undesirable fluorescence of mineral oils. (C)

OIL-STAIN REMOVERS: SAFE AND UNSAFE—ON COTTON AND RAYON GREY GOODS. *Rayon Tex. Mo.*, April 1937, P. 96.

A report issued jointly by the National Association of Finishers of Textile Fabrics and the American Association of Textile Chemists and Colorists. (C)

ORGANIC ACIDS ON CELLULOSE FIBRES: INFLUENCE OF. H. J. Henk. *Monat. Textil-Ind.*, 1937, V. 52, P. 23; abs. in *C. A.*, 1937, V. 31, Col. 2014. (W)

PERMANENT SIZING WITH ALKALI SOLUBLE CELLULOSE ETHERS. Wallace P. Cohoe. *Tex. Col.*, Mar., 1937, P. 183–9; *Rayon Tex. Mo.*, April 1937, P. 87.

Paper presented before the American Section of the Society of Chemical Industry, New York, N. Y., Feb. 10, 1937. (C)

pH CONTROL IN TEXTILE PRACTICE. J. Muir. *Tex. Mfr.*, March 1937, P. 115, 121.

Practical suggestions in the adoption of pH control by various methods where it was possible and a plea for more pooling of knowledge. (C)

PHYSICAL BASIS FOR STANDARDIZATION OF EVALUATION OF FASTNESS TO LIGHT (OF DYED TEXTILES). H. Rein. *Klepzig's Textil-Z.*, 1936, V. 39, P. 732; abs. in *C. A.*, 1937, V. 31, Col. 1622.

A lecture dealing with the action of light on dyes covering the whole spectrum, the influence of light intensity and climatic conditions, expts. on the evaluation of the fastness to light under the exclusion of artificial sources of light and practical results of the various factors discussed. (W)

POSITION ISOMERISM (STRUCTURAL DIFFERENCES) IN AZO DYES UPON THEIR FASTNESS TO LIGHT AND WASHING: INFLUENCE OF. Marion E. Griffith and Wallace R. Brode. Ohio Agr. Expt. Sta., *Bull.* 565, 1936, P. 3–19; abs. in *C. A.*, 1936, V. 30, Col. 1565; 1937, V. 31, Col. 1211.

The change in properties of isomeric monoazo dyestuffs produced by a shift in the position of the OH and sulfonic acid groups was studied.

After summarizing the results the authors state that: A true index of the fastness of a dyestuff should be arrived at by a comparison of the combined effects of light and washing on the dyestuff. This is referred to as the utility factor. (W)

PRINTING DYES FOR THE STENCIL PRINTING (OF TEXTILES). A. Franken. *Deut. Wollen-Gewerbe*, 1937, V. 69, P. 87–8; abs. in *C. A.*, 1937, V. 31, Col. 2012.

Many indanthrene and rapidogene dyes suitable for this purpose are listed, several dyeing recipes are given and the proper procedures are described. (W)

PRINTING OF RAYON PLUSH AND VELVET. Matt McGuire. *Silk and Rayon*, 1936, V. 10, P. 946–8; abs. in *C. A.*, 1937, V. 31, Col. 1621.

Rayon plush and velvet fabrics are prepd. for printing by scouring with soap or by a desizing treatment in warm H_2O, dressing the pile and drying in the stretched condition. Suitable thickeners, methods for steaming and typical formulas for the direct printing of substantive and basic dyes on acetate rayon are described. (W)

PRINTING VAT PASTES: NEW RESERVE AGENTS IN. J. S. Turski and J. Checinski. *Textilber.*, 1937, V. 18, P. 87; abs. in *Tex. Rec.*, April 6, 1937, P. 49.

For resisting vat dyes in printing the authors use dinitrobenzene and dinitronaphthalene, and describe a typical method for their use. They also note that with the same resists it is possible to secure colored reserves under vat dyes. (C)

RAYON AND STAPLE FIBRE CRÊPE YARNS AND FABRICS: SHRINKAGE IN ALKALI AND SOAP SOLUTIONS. W. Weltzien and J. Buchkremer. *Monatsh. Seide u. Kunstseide*, 1936, V. 41, P. 404–10, 448–54, 491–5; abs. in *J. T. I.*, April 1937, P. A217.

Investigations of the shrinking of viscose rayon and staple fibre crêpe yarns in caustic soda solution are described in detail and curves showing the changes in length of the yarns after alkali treatment and after souring, washing and drying are given. (C)

RAYON: USE OF NAPHTHOL AS ON. Hans Görlich. *Klepzig's Textil-Z.*, 1937, V. 40, P. 38–9; abs. in *C. A.*, 1937, V. 31, Col. 2011. (W)

REDUCING RE-DYES ON RAYON CRÊPES. Robert W. Pinault. *Rayon Tex. Mo.*, 1937, April, P. 89–90; May, P. 70–2. (C)

REMOVAL OF LUBRICATING OIL SPOTS FROM BLEACHED (TEXTILE) GOODS: DIFFICULTY IN. Walter Bruckhaus. *Deut. Wollen-Gewerbe*, 1936, V. 68, P. 1738; abs. in *C. A.*, 1937, V. 31, Col. 1217.

The main difficulty in the removal of lubricating oil spots from bleached goods is not the presence of the oil but graphite and metallic dust which is often present and is strongly retained by the fibre. While the oil is removed easily the other contaminations cause trouble in the bleach if they have not been taken out. (W)

SAPONIFICATION OF ACETATE RAYON. W. Maneeke. *Klepzig's Textil-Z.*, 1937, V. 40, P. 29–30; abs. in *C. A.*, 1937, V. 31, Col. 2015.

If Cellitone, Cellite or Cellitazole dyes are not used for acetate rayon, the latter must be superficially sapond. before dyeing. The sapon. is carried out in a bath contg. 5 g. NaOH and 1 g. of soap per l. at 80–90°. The goods thus treated can be dyed with cotton dyes, as the acetate is superficially converted into cellulose. Four cases of sapond. acetate rayon are discussed and photomicrographs are shown. (W)

SILK FABRICS PUCKERED BY PRINTED RESERVES. Jean Salque. *Rusta-Rayonne*, 1936, V. 11, P. 583, 585; abs. in *C. A.*, 1937, V. 31, Col. 869.

The principle of the method consists in printing a fatty or oily reserve on scoured and bleached silk fabric and treating the printed fabric with a chemical (preferably formic acid or HCl) that shrinks the unreserved portions. Practical operating directions are given on the optimum method of carrying out the process. (W)

SILK WEIGHTING: REVIEW OF U. S. PATENTS COVERING—1915–1935). Ellery H. Harvey. *Am. Dye. Rptr.*, April 5, 1937, *P.* 179–80, 198–9. (C)

SINGLE-BATH FAST DYEING FOR UNION FABRICS CONTAINING ACETATE RAYON. Georges Fauchey. *Rusta-Rayonne*, 1936, V. 11, P. 679, 681; abs. in *C. A.*, 1937, V. 31, Col. 2011.

Attention is drawn to the process developed by Imperial Chem. Industries, Ltd., in which the dye bath contains both special cellulose acetate dyes and indigosol dyes. The process is described and a few illustrative formulas are given. (W)

SIZES SUITABLE FOR RAYON. H. Roche. *Silk J. Rayon World*, 1936, V. 13, No. 151, P. 27; abs. in *C. A.*, 1937, V. 31, Col. 1625.

With the development of rayon, new sizing mixts. have been evolved. Those used in practice today are discussed. Where linseed or satd. oils are used, it is desirable to add a small amt. of pinene or cyclohexanol, to dissolve them, to counteract oxidation effect or induce a catalytic drying effect. (W)

SOFTENING ANTI-CREASE FINISHES ON COTTON. "Consultant." *Tex. Rec.*, April 6, 1937, P. 49.

In applying the synthetic resin necessary to give an anti-crease finish there is a distinct liability to harden the handle of cotton and other materials. English patent 451,082 covers a process designed to insure a soft finish without effecting the synthetic resin formation as usually carried out. The process involves an initial impregnation of the fabric with a 3% aqueous emulsion of Japan wax so that it contains its own weight of this emulsion, followed by impregnation with a 20% solution of dimethylol-urea containing 6 grams per litre of a mixture of the mono- and di-sodium phosphates. The fabric is then dried under tension so as to be free from creases and afterwards heated to about 160° C. for a few seconds to complete formation of the urea resin. (C)

SPECTROPHOTOMETRY: APPLICABILITY OF—TO THE SOLUTION OF COLOR PROBLEMS IN THE TEXTILE INDUSTRY. Arthur C. Hardy. *Am. Dye. Rptr.*, Feb. 8, 1937, P. 67–71.

Paper presented at A. A. T. C. C. Annual Meeting, Providence, R. I., Dec. 5, 1936. (C)

STAINLESS STEEL: SUITABILITY OF—COMPARED WITH OTHER METALS IN BLEACHING. Jos. E. Goodavage. *Am. Dye. Rptr.*, Feb. 8, 1937, P. 71–7.

Paper presented at A. A. T. C. C. Annual Meeting, Providence, R. I., Dec. 5, 1936. (C)

STRIPPING OF COLORS. Karl Volz. *Mell. Textilber.*, 1936, V. 17, P. 940–3; abs. in *C. A.*, 1937, V. 31, Col. 2012.

A general discussion covering various reagents and methods of their application in stripping from various fibres. (W)

TREATMENT WITH METALLIC SALT UPON RESISTANCE TO LIGHT OF SUBSTANTIVE DYES ON SEMI-WOOL FABRICS: INFLUENCE OF. Mark Leskin. *Sherstyanoe Delo*, 1936, No. 1, P. 54–5; abs. in *C. A.*, 1937, V. 31, Col. 2011.

Treatment of semi-wool fabrics dyed with substantive dyes with 1–2% solns. of $CuSO_4$ and $FeSO_4$, $K_2Cr_2O_7$ or formalin increased resistance. $K_2Cr_2O_7$ treatment gave the best results. (W)

VAT COLOR PRINTING: NOTES ON THE PROGRESS OF. "Technicus." *Tex. Col.*, 1937, Mar., P. 168–70; April, P. 231–3; May, P. 329–32. (C)

WETTING AGENTS IN TEXTILE PROCESSING. Part I. D. R. Dhingra, I. S. Uppal and K. Venkataraman. *J. Soc. Dyers Col.*, Mar. 1937, P. 91–100. (C)

WETTING AND DETERGENCY: SCIENTIFIC AND TECHNICAL ASPECTS. *Tex. Mfr.*, April 1937, P. 160, 163.

A series of papers read at a symposium on the scientific and technical aspects of wetting, held at the Imperial College, South Kensington, Eng., by the International Society of Leather Trades Chemists, show that progress is being made in knowledge of wetting, waterproofing, detergency, etc. (C)

WOOL: EFFECT OF HYDROGEN PEROXIDE. L. Armand. *Tiba*, 1937, V. 15, P. 5–11; abs. in *J. T. I.*, April 1937, P. A215.

The author has investigated in industrial practice the laboratory-scale experiments of Smith and Harris on the effect of hydrogen peroxide on wool (see *J. T. I.*, 1936, P. A336). He concluded that the bleaching of wool with hydrogen peroxide diminishes the wool's resistance to alkaline solutions. The least damage occurred at a concentration of 1–1.5 volume hydrogen peroxide, at a temperature of 50° C. and at pH about 8.5. Length of time of treatment and the addition of stabilizing agents were without effect. (C)

WOOL-LIKE FINISH: USE OF SYNTHETIC RESINS TO PRODUCE—ON SPUN-RAYON FABRICS. Philip LeBrun. *Tex. Wld.*, April 1937, P. 120.

Wool-like finishes on spun-rayon fabrics are an offspring of the numerous experiments in obtaining crease-resistant fabrics. While many dif-

ferent chemicals have been tried, the various condensation products of urea and formaldehyde give the best results to date. The author describes some of the methods thus employed. (C)

IV. Research Methods and Apparatus

Color Deviation in Piece Dyed Rayon Fabrics. Who's Fault is it? I. J. Saxl. *Rayon Tex. Mo.*, 1937, May, P. 73–4, June, P. 59–60.

In order to determine whether a yarn has been stretched excessively during the preparatory processes, the author describes the use of his chainomatic yarn tester for determining load vs. extension characteristics. There is strong indication to prove that the yarn which dyes a different shade has been overstretched in handling. (C)

Colorimeter: New Type of. E. R. Bolton and K. A. Williams. *J. Soc. Leather Trades Chem.*, 1936, V. 20, P. 504–12; cf. *J. Soc. Dyers Col.*, Mar. 1937, P. 103.

Light from an electric lamp, after passing through a 1% copper sulphate solution to remove infra-red rays, is transformed into pure colored light by means of a suitable filter, then passes through the material under test and falls on a photo-electric cell connected to a galvanometer. The apparatus is calibrated with a standard colorless liquid, similar in refractive index to that being tested. A complete analysis of the color requires measurements with 6 filters. No standardization of the incident light is necessary, and the effects of variation in density of the filters and of their ageing, and of varying efficiency of the photo-electric cells, are eliminated. There is fair agreement between the readings of this colorimeter and those of the Lovibond tintometer. (C)

Colorimetry with a Spectrometer. R. A. Houstoun and A. J. Younger. *Phil. Mag.*, Jan. 1937, P. 49–63.

This is an instrument that, while not giving all the coördinates necessarily, does use arrangements for describing colors in terms of the Munsell system. This is in terms of hues and saturations. The hues are adjusted by moving the telescope of the spectrometer, while the saturation is altered by rotating an analyzer in front of the eyepiece. (X)

Comparative Gloss Meter. Salford Electrical Instruments Ltd. *J. Sci. Instru.*, 1937, V. 14, P. 32–3; abs. in *J. T. I.*, April 1937, P. A229.

A comparative gloss meter incorporates a small lamp, fed from a 6-volt accumulator, as a source of light, housed in a lamp unit which is arranged so that when it is standing on a substantially flat surface, the surface is illuminated by a beam of light incident at an angle of 45°. Light which is reflected at the same angle is collected and operates a photocell which is connected to a microammeter. The readings obtained are indicative of the relative gloss of similar surfaces. Measurements of the diffuse light reflected from the surface can be made after suitably adjusting the position of the photocell. Rheostats are provided to adjust the sensitivity of the instrument so that it can be read directly, the scale of the microammeter being marked 0–100%. It is adjusted for 100% reading on the surface

used as the standard, and is then ready for direct reading on other test surfaces. (C)

CUPRAMMONIUM VISCOSITY OF PULP: DETERMINING THE. F. A. Ennevaara. *Paper Trade J.*, May 6, 1937, P. 45–6.

Description of a rapid method based on the TAPPI (Technical Association of the Pulp and Paper Industry) standard and which makes use of cuprammonium solution of similar strength and also uses standard viscosity tubes. Results can be obtained within half an hour and the method has been applied successfully to process control. Duplicate samples usually check within 3 to 4%. (C)

ELECTRICAL MEASUREMENT OF SILK-THREAD DIAMETER. O. H. Schuck. *Elec. Eng.*, Sept. 1936, P. 991–6; abs. in *Eastman Kodak Abs. Bull.*, Jan. 1937.

The thread is passed through the jaws of a caliper which are coupled to the capacitor plates of an ultramicrometer circuit. Besides continuously recording the thread diameter, the apparatus features an integrating device whereby a quality rating is given. (S)

FLEECE DENSITY OF SHEEP: WYEDESA FLEECE CALIPER (FOR DETERMINING). Robert H. Burns. *J. T. I.*, April 1937, P. T113–T128.

The accuracy of the Wyedesa Fleece Caliper for determining the fleece density of sheep, as indicated by the variation between quadruplicate samples and by a comparison with contiguous quadruplicate samples, is reported. The literature on fleece density determination is summarized. The accuracy of engineer's calipers and the Wyedesa Fleece Caliper, as shown by the variation of replicate samples, is reported. (C)

FLEXEASE TEST FOR YARNS. Edward Kennedy. *Am. Dye Rptr.*, April 19, 1937, P. 228–9.

Describes a new instrument and technique for determining the flexibility of yarn. (C)

FRICTION TAPES AND RUBBER TAPES: TESTING. W. H. S. Youry. *Instruments*, 1936, V. 9, P. 339–40; abs. in *J. T. I.*, April 1937, P. A218.

Methods of determining the adhesion and tackiness of friction and rubber tapes and the effects of ageing are described. (C)

INSULATING MATERIALS: CONDITIONING FOR TEST. R. Burns. *Proc. Amer. Soc. Testing Materials*, 1936, V. 36, Pt. II, P. 600–19; abs. in *J. T. I.*, April 1937, P. A222.

The importance of conditioning to definite atmospheric R.H. and temperature when testing insulating materials is emphasized and a table is given that shows the effect of conditions on the electrical and mechanical properties of the usual materials. As a means of controlling humidity the author recommends the use of saturated salt solutions and describes a suitable humidifying chamber. (C)

MEASUREMENT: HIGH SPEED PHOTOGRAPHIC METHODS OF. Edgerton, Germeshausen and Grier. *J. Applied Physics*, Jan. 1937, P. 2–9. (C)

MEASUREMENT OF THE TENSION, SMOOTHNESS AND FLEXIBILITY OF RAYON THREADS. J. Buchkremer. *Klepzig's Textil-Z.*, 1937, V. 40, P. 7–13; abs. in *C. A.*, 1937, V. 31, Col. 1625.

Detns. carried out by means of the fibre tension knife "Krefeld" are described, suitable arrangements for making such measurements are shown in several illustrations and exptl. results obtained are given. (W)

OPTICS AND THE TEXTILE INDUSTRY. Edward R. Schwarz. *J. Opt. Soc. Am.*, 1937, V. 27, P. 44–50; abs. in *C. A.*, 1937, V. 31, Col. 1623. (W)

RAYON FABRICS: LUSTRE FASTNESS TEST. J. Pinte and A. Delhalle. *Bull. Fed. Int. Assoc. Chim. et Couleur*, 1936, V. 2, P. 42–60; also *Bull. Trim. Lab. d'Anal. Rech. Ind., Roubaix*, 1936, No. 32, P. 9–15; No. 33, 11–20; abs. in *J. T. I.*, April 1937, P. A218.

The Toussaint photo-electric colorimeter may be used in the measurement of the lustre-fastness of rayon fabrics in operations like laundering. The arrangement and calculations from the amperage in the positions of maximum and minimum reflection from the specimen are briefly described and results are recorded on the effects of washing various white and blue, viscose and acetate fabrics, some originally matt and others lustrous. It is shown that each washing of a lustrous rayon results in some dulling, due to "fibering." Comparisons of dyed materials can only be made if the dyeings are quite fast to washing, since a loss of dye interferes with the lustre effect. (C)

REGAIN STANDARDS ASSAILED. Anon. *Tex. Wld.*, April 1937, P. 114–5.

Report of Spring Meeting of Committee D–13 (Textile) of the A. S. T. M. at Providence, R. I., Mar. 10–12, including abstracts of papers. Features paper of R. H. Brown, chairman of the sub-committee on atmospheric conditions, recommending that D–13 "adopt the method of conditioning samples in the standard atmosphere as the preferred method for all physical testing, numbering, and correcting of weights." It was emphasized "that standard regain is at best an arbitrary figure and that normal regain varies with the history of the material tested and also with the impurities it contains." (C)

STRENGTH AND UNIFORMITY OF YARNS. Heinrich Dietz. *Mell. Textilber.*, 1937, No. 4, P. 288.

The strength characteristic shows the dependence of the strength upon the length between the clamps of the testing machine, and permits of recognizing the two main factors of yarn strength; the strength of the substance and the quality of manufacture. The strength closely approximates to the substance strength when the length between clamps is 0.1 mm. When the length is 0.5 mm., the strength depends more upon the substance strength than upon the spinning process, especially in long-fibre yarns. The decimal balance breaking strength and the irregularity determined by the dynamic test under a constant load give a more reliable impression of the use to which a given yarn can be put. (C)

SURFACE VARIATIONS OR UNEVENNESS? Robert Finlay. *Rayon Tex. Mo.*, April, 1937, P. 73–4.

The author controverts the conclusions of an article (*Rayon Tex. Mo.*, Feb. 1936, P. 43–4) crediting the "Gleifometer" (see *Tex. Rsch.*, Jan. 1937,

P. 158), a German invention (D. R. P. 597,282), as a perfect and accurate apparatus for measuring yarn evenness. The author contends that the "Gleifometer" charts merely illustrate microscopic, not macroscopic, variations in thread surfaces, and that although the charted variations may lead to constructive applications, they do not measure what is known as evenness in textile yarns; the average macroscopic variation in regularity of a relatively long length of yarn. (C)

TEXTILE TESTING LABORATORIES. Robert H. Brown. *Tex. Age.*, May 1937, P. 58–60.

The most accurate and sensitive testing instruments are not to be relied upon unless they are free from fluctuations of temperature, air currents and humidity. Conditions under which accurate testing may be conducted are described. (C)

THREADS AND FABRICS: NOTE ON THE UNCREASABILITY OF. G. Cuillerand. *Tiba*, 1936, V. 14, P. 827, 829; abs. in *C. A.*, 1937, V. 31, Col. 1215.

A test is proposed, based on that of Hall (*C. A.*, *24*, 6127) but with conditions under better control. Wind the thread helically (adjacent turns just touching) under slight tension (without stretching) around a piece of cardboard about 5–6 cm. by 2–3 cm. by 1 mm., allow to stand for 1 hr. in an atm. of const. humidity, cut the cardboard (and threads) longitudinally about halfway across its width, after about 10 min. measure the angle of each thread at the place where it was bent and average the measurements; if θ is angle obtained with the untreated thread and θ' that for the thread treated to render it uncreasable, the coeff. of uncreasability is defined as $(\theta - \theta')/(180 - \theta)$. Increase in atm. humidity or excessive tension in winding the thread around the cardboard decreases the coeff. Temp. variations over a range of 10–30° have a negligible effect. (W)

TRAPEZOID TEARING TEST: SIMPLIFYING THE. H. R. Bellinson. *Rayon Tex. Mo.*, April 1937, P. 75–6; *Tex. Rsch.*, Mar. 1937, P. 208–10. (C)

WATER: NOVEL PROOFING TESTER FOR DETERMINING THE EXTENT TO WHICH TEXTILES ABSORB OR ARE PERMEABLE BY. Franz and Henning. *Mell. Textilber.*, 1936, P. 926.

The authors describe a new apparatus for testing water-repelling or water-proof fabrics. In conclusion a number of figures are given which prove that the apparatus can also be used for testing yarns. (C)

WOOLEN AND WORSTED LUBRICANTS: NEW WAYS OF TESTING. Werner von Bergen. *Am. Dye. Rptr.*, May 3, 1937, P. 246, 256–60; *Rayon Tex. Mo.*, 1937, May, P. 60–2, June, P. 55–7.

Discusses the fundamental principles of wool lubrication, the test methods used in testing olive oils and its various substitutes on basis of actual mill trials as well as laboratory tests. A new ageing test developed with the Fade-o-meter is introduced, which gives in 40 hours the same result as heretofore required one year. The back-washing test is replaced by a washing test in the Launder-Ometer. By comparing the different substitutes with olive oil, it was found with these new tests that the manufactured vegetable esters are in their general properties equal to high grade olive oil and superior in their uniformity, whereas the mineral oil-containing lubricants are lacking more or less in their scourability. (C)

X-RAY DIFFRACTION METHODS: USES AND LIMITATIONS OF. John T. Norton. *J. Appl. Physics,* May 1937, P. 307–12.

A paper delivered at Symposium on Metals, Cambridge, Mass., Jan. 29, 1937, in which the author outlines the basic types of information which may be obtained by X-ray diffraction so that one unfamiliar with X-rays can appreciate the fields in which this information might be useful. (C)

YARN TESTING BY THE EVALUATION OF CURVES. (German.) W. Topert. *Mell. Textilber.,* 1936, V. 9, P. 705.

The author shows by means of the results of a large number of mill tests how a check can be systematically kept upon the breaking strength and the extension of yarn by means of frequency curves. (S)

V. ECONOMICS, PHYSICS AND MISCELLANY

ACRYLIC RESINS. L. G. Garside. *Rev. gen. mat. plastiques,* Dec. 1936, P. 339–43; abs. in *Eastman Kodak Abs. Bull.,* Mar. 1937, P. 151.

The properties and uses of acrylic resins and mixtures of acrylic resins and cellulose esters are described. (S)

CELLULOSE ESTER SOLUTIONS: DETERMINATION OF SPECIFIC WEIGHT OF. W. Kumichel and C. Trogus. *Cellulosechemie,* 1936, V. 17, No. 10, P. 97–102; abs. in *Eastman Kodak Abs. Bull.,* Mar. 1937, P. 147.

The specific weight of nitrocellulose is measured as a function of temperature and concentration. An attempt is made to coordinate the specific volumes and the relative viscosities of several fractions of different collodions but the results are inconclusive. On the basis of the refractometric measurements, the authors calculated the specific weight of trinitrocellulose in acetone solution and in p-methylcyclohexanone solution. There is satisfactory agreement between these values and those calculated from the x-ray examination of the same systems. (S)

CONDENSATION OF CELLULOSE WITH BENZOL. A. A. Nikolsky. *J. Gen. Chem. (U.S.S.R.),* 1936, V. 6, No. 8, P. 1151–6; abs. in *Eastman Kodak Abs. Bull.,* Jan. 1937.

A study was made of the fractions obtained in the dry distillation of the cellulose phenyl desoxene formed by the condensation of cellulose with benzene. The following products were obtained in the fractions above 120° C.: diphenyl methane, naphthalene, and a crystalline product melting at 56° C. and called diphenyl pyrane. Previous studies had shown the presence of toluene in the lower fractions. (S)

FRACTIONATION OF HIGHLY POLYMERIZED MATERIALS THROUGH THE CHROMATOGRAPHIC ADSORPTION ANALYSIS. I. FRACTIONATION OF ACETYL CELLULOSE. H. Mark and G. Saito. *Monatsh. Chem.,* 1936, V. 68, No. 3/4, P. 237–43; abs. in *Eastman Kodak Abs. Bull.,* Jan. 1937.

When an acetyl cellulose solution was filtered through three successive layers of blood charcoal, it was found that the viscosity of the filtrate increased. Each of the three layers was washed out thoroughly with acetone and the previously adsorbed solute recovered by drying. When the dried solutes were dissolved again in acetone, the viscosities of the solutions in-

creased from the first to the third layers. Since analysis showed no change in acetyl content, the conclusion is reached that the fractionation by adsorption is governed principally by the particle size or the chain length. (S)

INSTRUMENTATION STUDIES. XI. By the Staff of the Institute of Paper Chemistry. *Paper Trade J.*, April 8, 1937, P. 40.

While this is a survey of the literature pertaining to the effect of humidity in the physical testing of paper, it contains many references that apply to cellulosic textile materials.

XII. *Ibid.*, April 15, 1937, P. 44–8. Effect of relative humidity on physical properties (of paper) with respect to the hysteresis effect in changes from one humidity to another.

XIII. ADAPTABILITY OF THE G. E. REFLECTION METER AS A COLOR ANALYZER. *Ibid.*, 1937, May 6, P. 47–53; May 13, P. 51–63. The lack of correlation between the color readings obtained on the reflection meter (as now furnished to the paper industry) and the Hardy color analyzer is discussed. The method for decreasing the discrepancies so that the two sets of data agree within an average limit of 10% is described. The accuracy, sensitivity, range, and applicability are given, and the reproducibility on one instrument over a period of time, and from instrument to instrument, is set forth, together with the various factors affecting the reproducibility. Data are given showing the type of agreement to be expected on a wide range of samples selected as representative of the variation of colors and surfaces to be encountered in the paper industry. (C)

KINEMATICS OF CHAIN POLYMERIZATION OF PURE STYRENE BY HEAT. G. V. Schulz and E. Husemann. *Z. physik. Chem.*, 1936, V. 34B, No. 3/4, P. 187–213; abs. in *Eastman Kodak Abs. Bull.*, Mar. 1937, P. 145.

Quantitative fractionation of the products of polymerization styrene in solution in methyl ethyl ketone gives a molecular weight distribution curve in agreement with the authors' previously propounded theories of polymerization processes (*Ibid.*, 30B:379, 1935; 32B:27, 1936; 176A:335, 1936; 177A:453, 1936). The polymerization of pure styrene was studied at 79.5°, 100.5°, and 131.5°C., using glass vessels specially cleaned until free from all oxidizing impurities. The weight of polymer formed at known intervals of time was determined by quantitative precipitation in methanol and the molecular weights of the polymers were measured viscosimetrically, allowances being made for branching of the polymer chains. The average degree of polymerization remained constant (at a given temperature) throughout the polymerization process but diminished with rising temperature. No induction period was found and the reaction was approximately of the first order up to about 60% polymerization. The rate of the primary activation reaction was given by the expression $k_1 = Ae^{-qA/RT}$, where $qA = 23,200$ cal. and $A = 10^{5.38} \times \text{sec.}^{-1}$. Using mathematical relations deduced in previous papers, the constancy of the average degree of polymerization during the reaction is interpreted as implying a like constancy of the ratio x of the speeds of polymer growth and chain breaking. The chain breaking of the reaction chains is thought to be due to transfer of a hydrogen atom from one growing chain to another. The ratio x is of the order of 10^{-3} and its logarithm is shown to bear a linear relation to the reciprocal of the absolute temperature. (S)

MOLECULAR SIZE, SHAPE, AND ELASTIC PROPERTIES OF HIGHLY POLYMERIZED SYSTEMS: RELATION BETWEEN. W. Kihn. *Kolloid-Z.*, 1936, V. 76, No. 3, P. 258–71; abs. in *Eastman Kodak Abs. Bull.*, Mar. 1937, P. 145.

By statistical and thermodynamic principles, the author derives the equation: $\epsilon = 1/\nu(\sigma U \sigma \nu) + 7RT(p/M)$, wherein ϵ is Young's modulus of elasticity, ν, the deformation of the sample, U, the internal energy of the sample, R, the gas constant per mol, T, the absolute temperature, p, the density and M, the molecular weight. If no crystallization occurs on extension, the author asserts that $(\delta U/\sigma\nu)_T = 0$ and the equation becomes: $\epsilon = 7rt\ (p/M)$. Employing this relation on various rubber samples, molecular weights obtained were in the range from 20,000 to 100,000. (S)

PHYSICAL BASIS OF COLOR MEASUREMENT. Arthur C. Hardy. *J. Appl. Physics,* April 1937, P. 233–8.

Paper presented at American Physical Society Symposium on Physics in the Textile Industry held at Chapel Hill, N. C. (C)

PROPERTIES OF BUILT-UP PROTEIN FILMS. I. Langmuir, V. J. Schaefer and D. M. Wrinch. *Science,* Jan. 15, 1937, P. 76–80.

In the questions of absorption and adsorption of the mixtures of binders and softeners such as used in sizes and throwing compounds the surface active forces play a most important role. In this paper will be found a critical discussion of the methods developed by Langmuir and Blotgett for studying monolayers of higher fatty acids. Further experiments were made by the authors in order to determine whether their methods are also applicable to layers and monolayers of protein substances. Monolayers of protein were transferred from water surfaces on to solid surfaces and optical methods were used for measuring their thickness. A study was made of protein films at the innerface between water and hydrocarbons (a similar condition exists in wetting-out yarns with sizes or throwing compounds containing protein in the form of gelatin, and hydrocarbon in the form of sulphated fatty alcohols or sulphonated oils). According to this paper, it seems to be a good working hypothesis that the protein monolayer is a two-dimensional network, which is held together by strong elastic springs. This is contrary to previous hypotheses which assumed a structure of inter-connecting chains of poly-peptides. (X)

TEXTILE RESEARCH: PLACE OF STATISTICS IN. J. P. Elting. *J. Appl. Physics,* April 1937, P. 239–45.

The solution of problems in the textile industry can be attained only through the application of all phases of statistical methods. By this is meant, not merely the statistical handling of data, but the complete study of sampling, instrumentation, techniques of measurement, probability theory, and statistical control of manufacture. In this way alone can significant data be obtained and reliable conclusions drawn. When such studies find themselves full-fledged and in common use, the manufacture of cotton textiles may be elevated from the state of an art to that of a science. (C)